

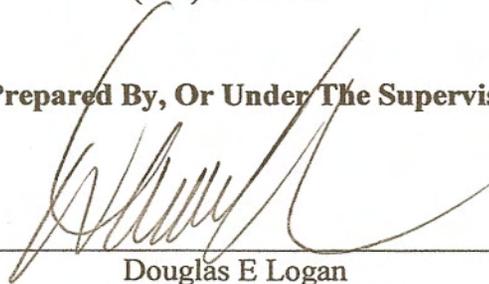
PRELIMINARY DRAINAGE STUDY FOR TPM 20793

Project Name
TPM
Misson Ridge Road
Fallbrook CA 92028

Applicant
Mr. Jerry Winter

Prepared By
HL Engineering & Surveying
759 W 4th Avenue, Escondido, CA 92025
(760) 741-0533

Report Prepared By, Or Under The Supervision Of



Douglas E Logan
RCE 39726, Exp. 12-31-07



December 7, 2004
Revised: February 5, 2005
Revised: April 27, 2006

HLES 5381

Susan Hoang (DPW)
County of San Diego
5201 Ruffin Road
San Diego CA 92123

Preliminary Drainage Study For TPM 20793

To Whom It May Concern,

In accordance with your recent request letter, I have prepared the following "Preliminary Drainage Study for TPM 20793. This revised report addresses; peak runoff rates (cfs) and velocities (fps) for pre-development and post development, shows how the project will address discharge quantities and velocities, discusses mitigating measures, shows capacity and cross sections of the canyons, and shows that there is no significant change in either diversion or concentration that will impact downstream property owners as a result of the subdivision.

The subject property is located on a prominent ridge, just east of Interstate 15 Freeway and south of Rainbow Valley. The top of the ridge had been previously graded in accordance with a County L-Grading Plan for a borrow site. This proposed Tentative Parcel Map divides the approximate 20-acre site into 4 parcels with all development occurring along the graded ridge top. We have prepared a Conceptual Grading Plan for the proposed residential development of these proposed parcels. This study addresses the drainage as shown on that Conceptual Plan.

Two off-site basins totaling approximately 36 acres lie to the north of the site and drain into a deep canyon that traverses the site along its westerly boundary. This study also contains an analysis of the 100-year storm elevations and lines of inundation along this canyon. It is noted that the ridgeline containing the proposed grading and development parallels the canyon. A very steep slope extends 100 feet downward from the ridgeline to the flow line of the canyon.

A drainage summary is shown elsewhere in this report. That summary reflects the individual isolated drainage areas that will be created by the proposed development. The run-off from the developed area along the subject ridgeline has always been divided into the major drainage ways (canyons) that parallel the ridge to the east and west, the same is true after development. An asphalt-paved roadway will traverse the ridgeline extending to the north where it connects to an existing easement road.

Engineers • Planners • Surveyors

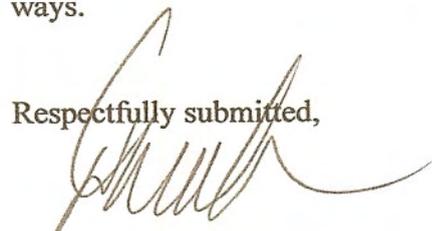
Prior to this proposed Tentative Parcel Map and subsequent development the 100-year storm event, the subject property generated run-off into the easterly canyon of 33.59 cfs, while 32.72 cfs sheet flowed down slope to the canyon along the west side. After the proposed development is completed this run-off to the east will increase from 33.59 to 39.15 cfs (+5.56 cfs or 16.5%), while the run-off to west will increase from 32.72 to 35.48 cfs (+2.76 cfs or 8.4%). Total change from pre-development to proposed is an increase from 66.32 cfs to 74.63 cfs +8.31 cfs or 12.5%). This increase is considered to be insignificant to the overall drainage quantities and there are no changes to existing patterns. This increase is attributed to increased run-off factors associated with A.C. paved roadway, driveways and other hard surfaces proposed by this development.

The attached Conceptual Grading Plan also includes numerous isolated drainage spillways that take isolated pads and roadway sections into small acreages. With the usage of riprap energy dissipation and bio-filter swales, these flows are returned to near normal sheet flow condition, in this manner any possible increase in erosion or siltation will be eliminated.

Lines of inundation to the 100-year storm event for the drainage way along the west side of the site are also shown on the attached Grading Plan. Calculations to support these water surface flows are included in this report. Note that soil type B is shown on the included soil map. However due to steep terrain and in order to establish a more conservative run-off quantity, I have increased the C factor from 0.32 (Type B) to 0.36 (Type C) for purpose of this study

In conclusion, it is my professional opinion that this proposed project will not have a significant impact on existing drainage quantities or patterns. It is also noted that flooding is impossible due to dramatic terrain difference in elevations between all development areas and the adjacent drainage ways.

Respectfully submitted,

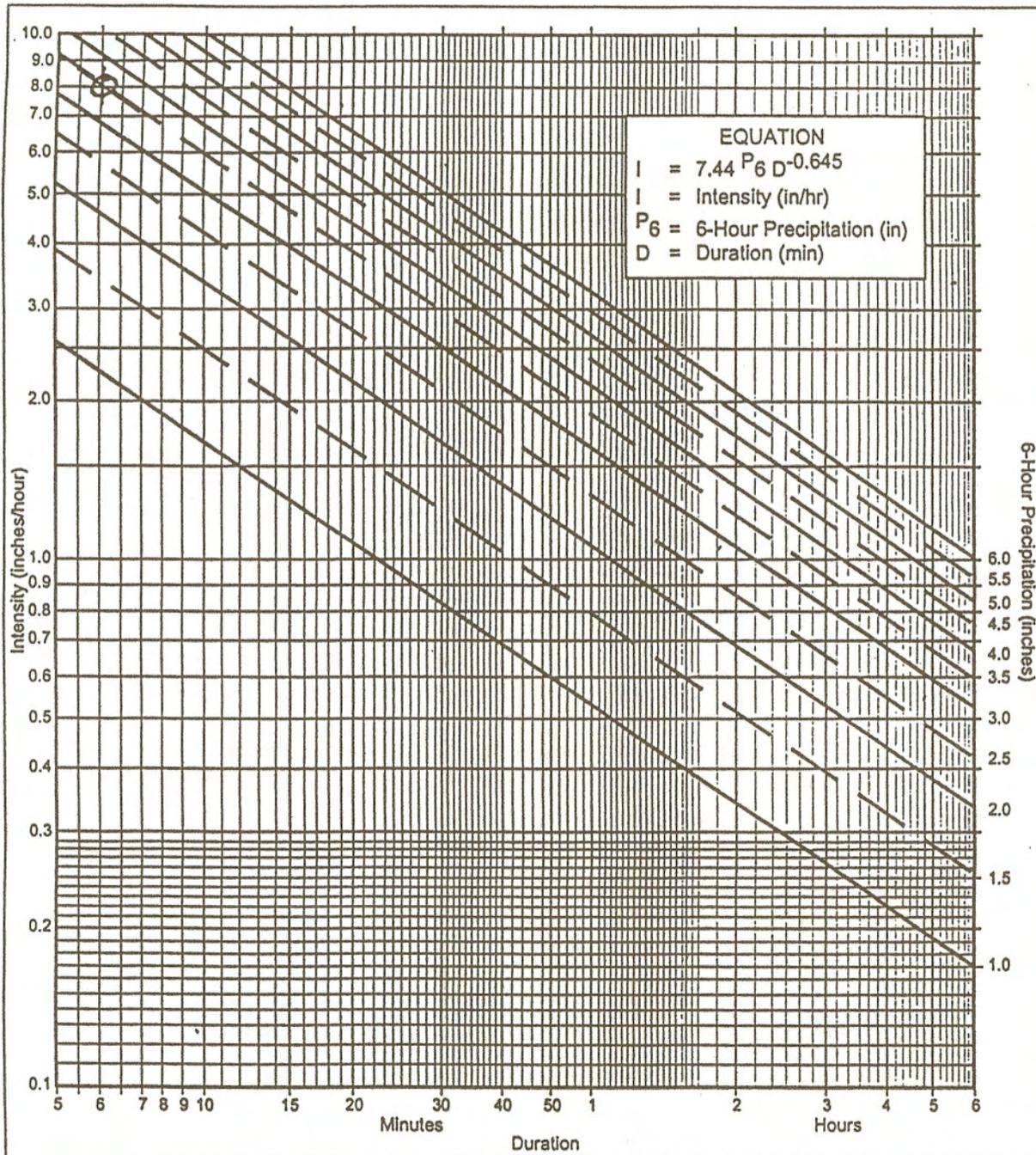


Douglas E Logan
Registered Professional Civil Engineer

**TPM 20793
DRAINAGE BASIN
SUMMARY**

BASIN	ACERAGE	C-FACTOR	Tc	100 YR I	CFS
AA	25.8	0.36	6.0	8.0	74.3
BB	10.3	0.36	6.4	7.7	28.6
CC	9.3	0.36	8.1	6.86	23.0
DD	2.6	0.36	8.1	6.86	6.4
<i>Total Run off West Canyon (natural)</i>					
132.3				Use 133.0	
East Canyon					
EE	28.1	0.36	6.0	8.0	80.9
AFTER DEVELOPMENT					
A	0.27	0.79	5.0	9.22	1.97
B	0.70	0.36	"	"	2.32
C	0.45	0.36	"	"	1.49
D	0.44	0.55	"	"	2.23
E	0.31	0.76	"	"	2.17
F	1.48	0.55	"	"	7.51
G	0.35	0.65	"	"	2.10
H	0.70	0.55	"	"	3.55
I	0.14	0.80	"	"	1.03
K	2.65	0.36	"	"	8.80
L	5.60	0.36	"	"	18.59
M	4.91	0.36	"	"	16.30
N	1.98	0.36	"	"	6.57
Total					74.63
<u>SUBJECT SITE PRIOR TO TPM</u>					
XX (East)	10.12	0.36	5.0	9.22	33.59
YY (West)	9.86	0.36	5.0	9.22	32.72

After Development East Basin = sum of L+A+E+G+I+H+D= 39.15 cfs
 After Development West Basin = Sum of N+B+K+C+M = 35.48 cfs



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

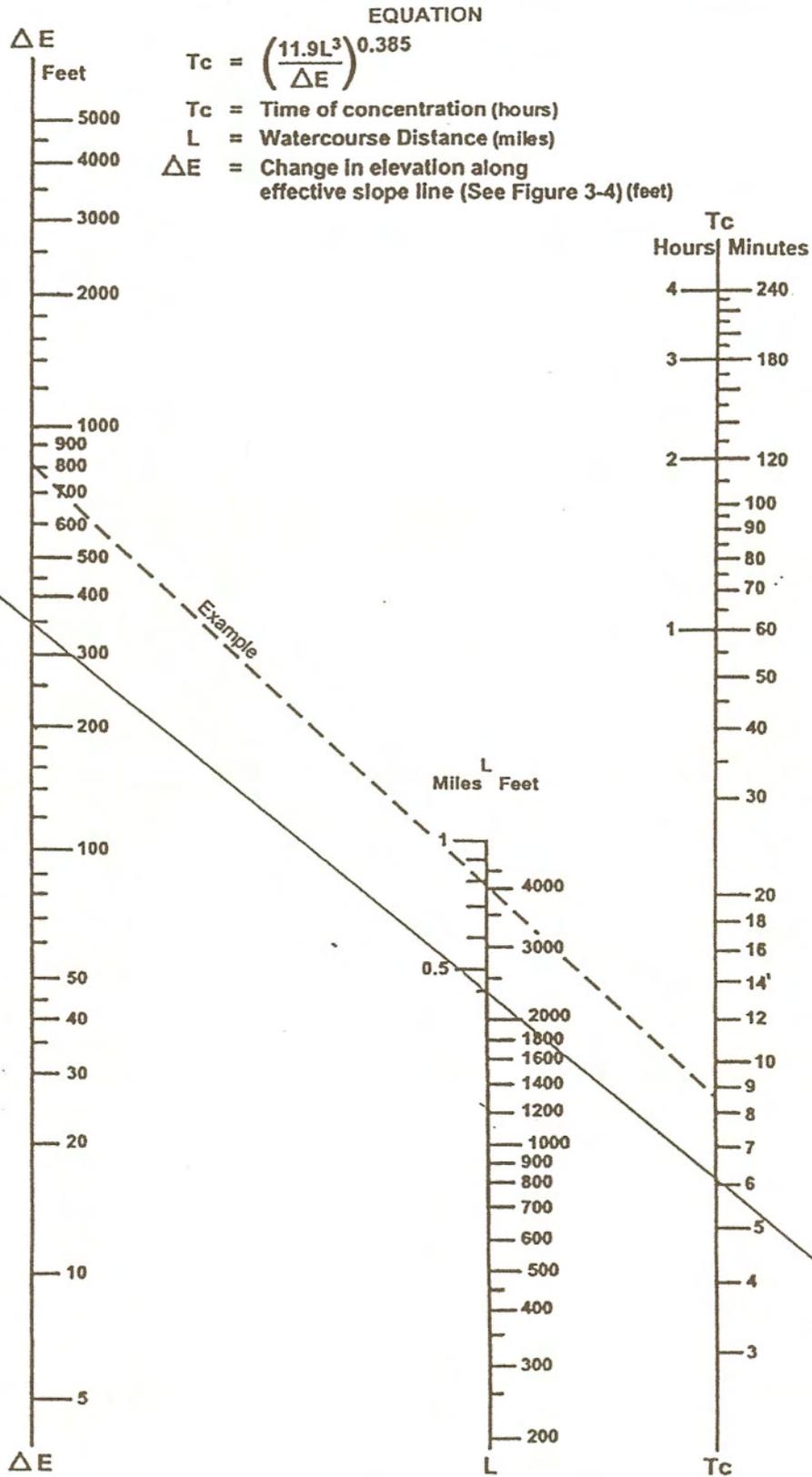
Application Form:

- (a) Selected frequency 100 year
- (b) $P_6 = 3.5$ in., $P_{24} = 6.0$ in., $\frac{P_6}{P_{24}} = 58\%$ ⁽²⁾
- (c) Adjusted $P_6^{(2)} = 3.5$ in.
- (d) $t_x = 6$ min. 5 min
- (e) $I = 8.0$ in./hr. = 9.2 in/hr

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.65	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template



SOURCE: California Division of Highways (1941) and Kirpich (1940)

**Nomograph for Determination of
Time of Concentration (T_c) for Natural Watersheds**

FIGURE

3-3

County of San Diego Hydrology Manual

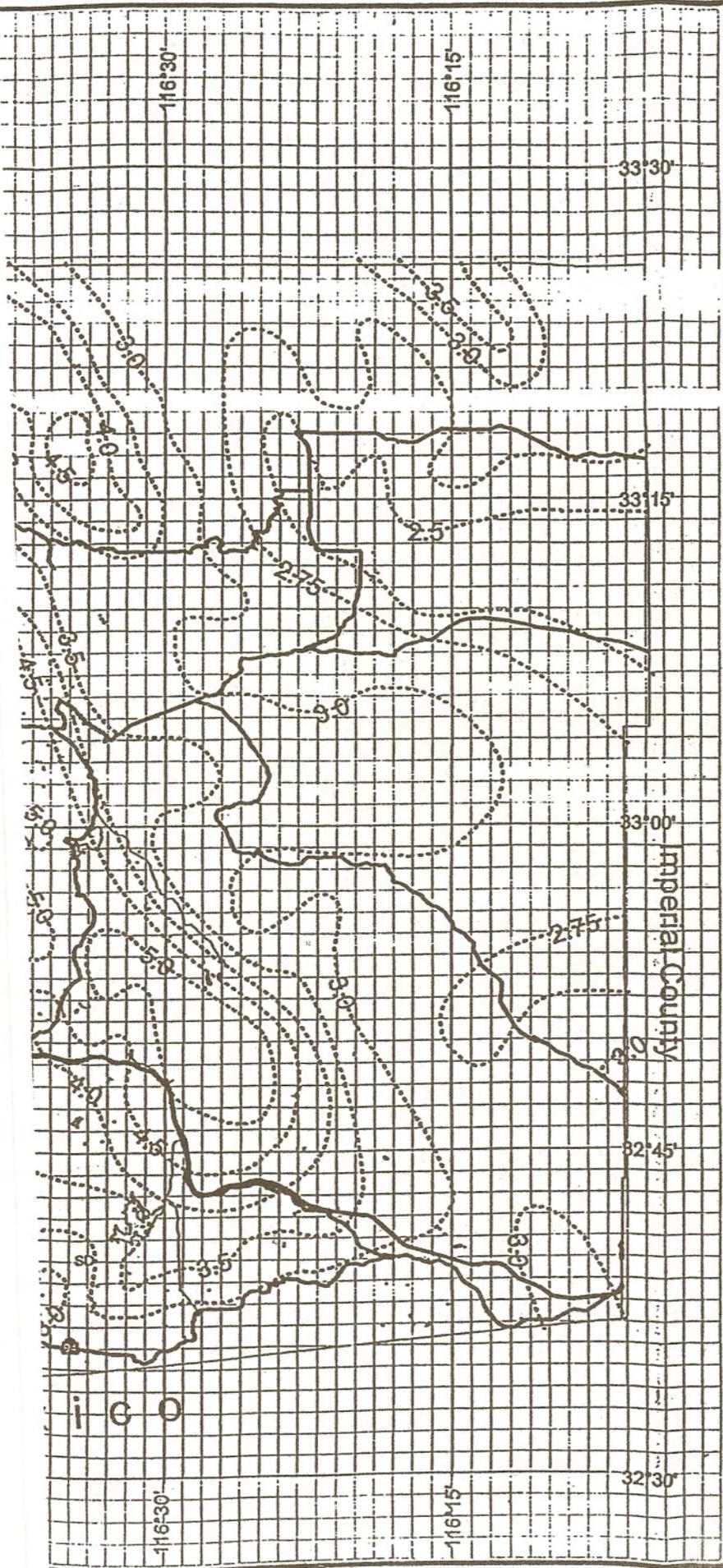


Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

3.5 Isopluvial (inches)

PAGE 1 of 2
3.5



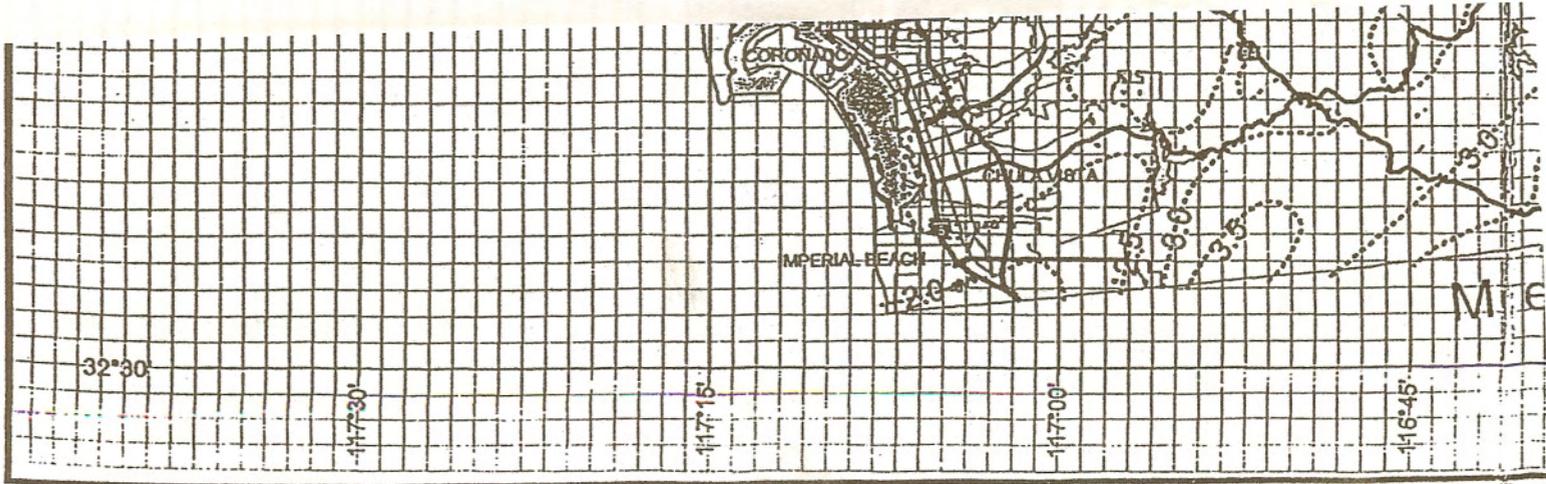
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County of San Diego Hydrology Manual



Rainfall Isophuvials

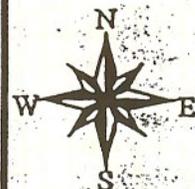
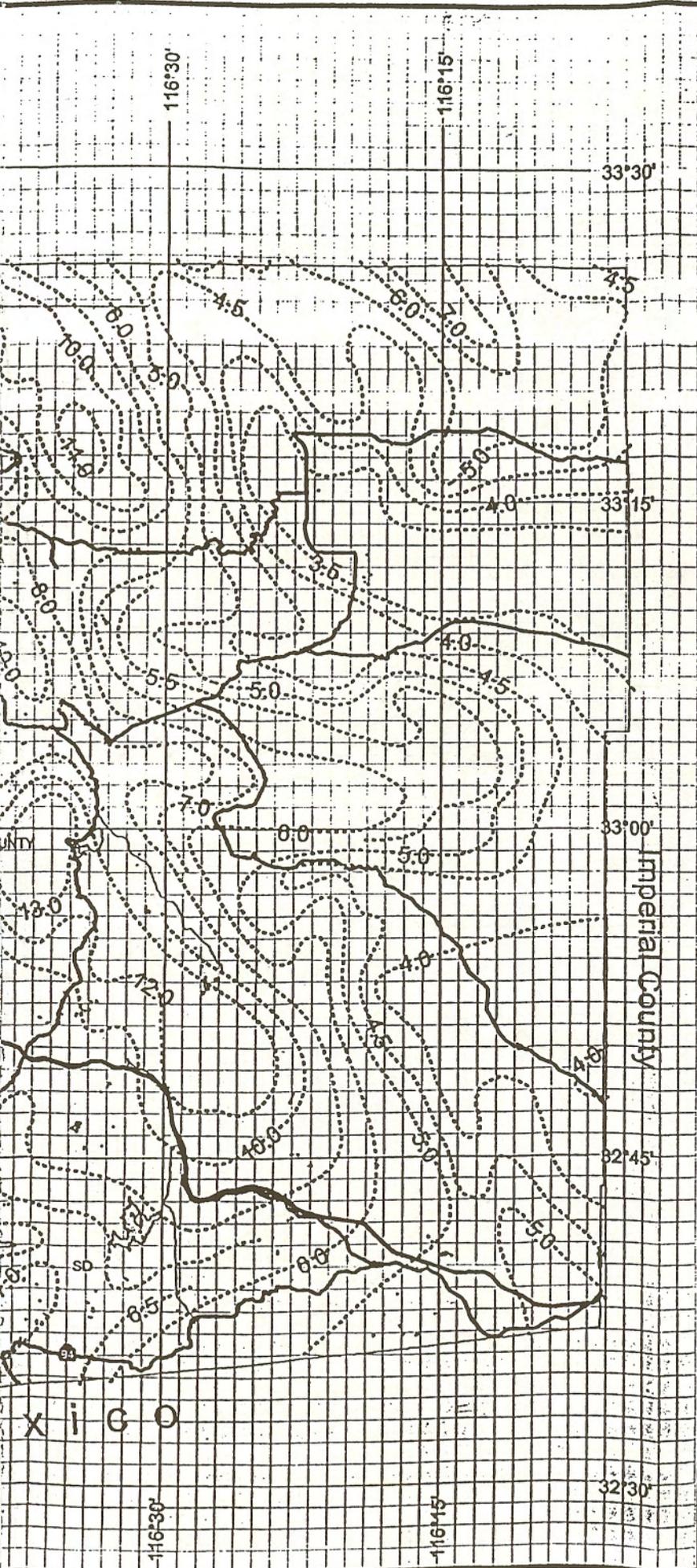
100 Year Rainfall Event - 24 Hours

6.0 Isopluvial (inches)

6.0

Page 1 of 2

6.0

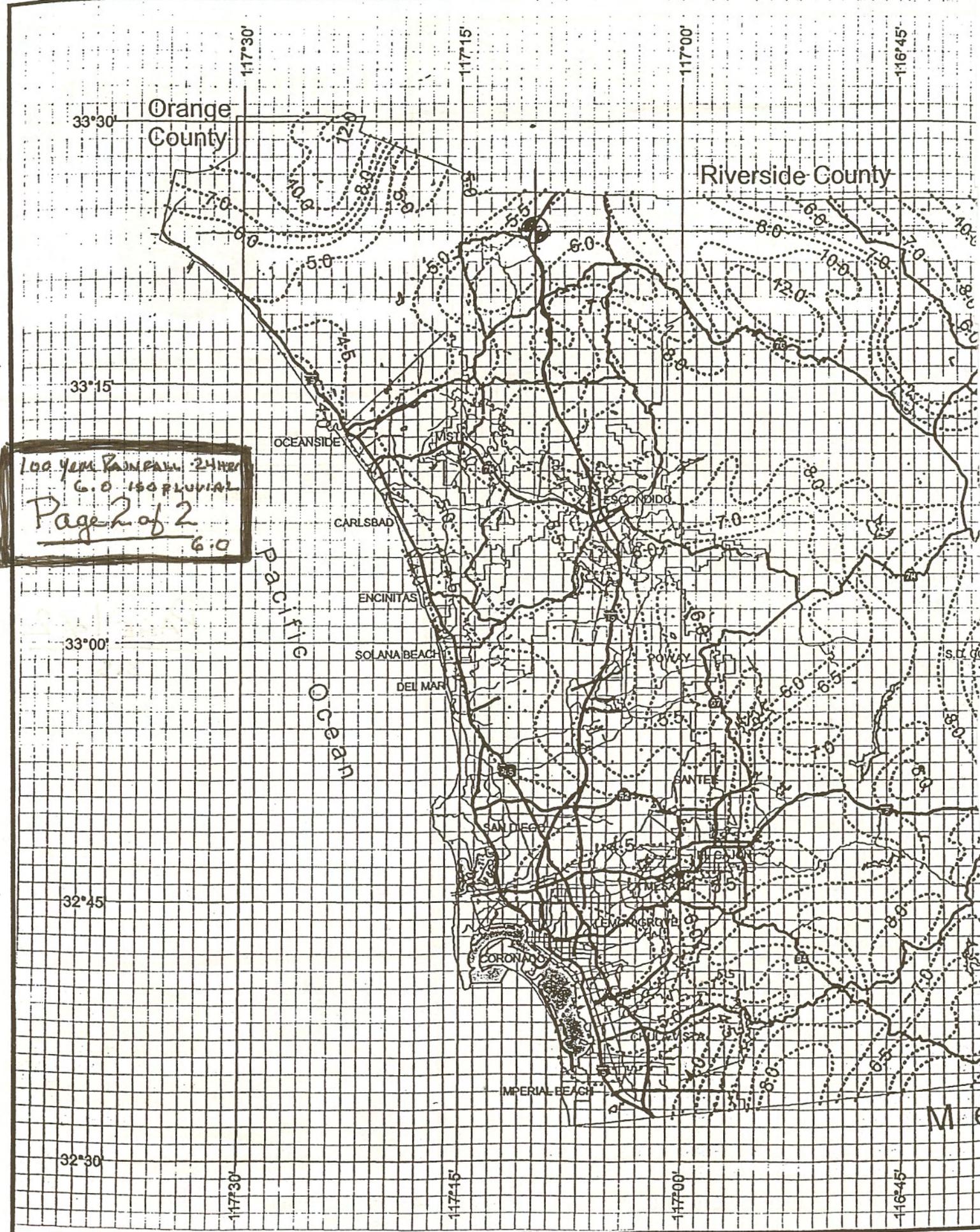


3 0 3 Miles

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**100 YEAR
STORM EVENT**

LINES OF INUNDATION

TPM 20793

2 20.00 630.00
3 62.00 650.00

=====

INFORMATION FOR CROSS-SECTION NUMBER: 4 *19u*
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 250.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	650.00
2	14.00	640.00
3	24.00	636.00
4	49.00	650.00

=====

INFORMATION FOR CROSS-SECTION NUMBER: 5 *18+20*
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 330.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	650.00
2	25.00	640.00
3	30.00	639.00
4	35.00	640.00
5	55.00	650.00

=====

INFORMATION FOR CROSS-SECTION NUMBER: 6 *17+60*
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 390.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	660.00
2	20.00	650.00
3	23.00	649.00
4	26.00	650.00
5	44.00	658.00
6	64.00	668.00

=====

INFORMATION FOR CROSS-SECTION NUMBER: 7 *17u*
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 450.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	666.00
2	5.00	664.00
3	10.00	662.00
4	20.00	660.00
5	30.00	662.00
6	35.00	664.00
7	65.00	674.00

=====

INFORMATION FOR CROSS-SECTION NUMBER: 8 *16u*
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000

NODAL POINT COORDINATE INFORMATION:

162

NODE NO.	X(ft.)	Y(elev.)
1	.00	684.00
2	3.00	682.00
3	16.00	680.00
4	21.00	678.00
5	26.00	676.00
6	31.00	678.00
7	36.00	680.00
8	56.00	690.00

===== INFORMATION FOR CROSS-SECTION NUMBER: 9

152

MANNINGS FRICTION FACTOR = .04500
 KINETIC ENERGY CORRECTION FACTOR = 1.000
 EDDY LOSS FACTOR = 2.000
 DISTANCE(ft.) TO CROSS-SECTION #1 = 650.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	704.00
2	3.00	702.00
3	6.00	700.00
4	9.00	699.00
5	34.00	699.00
6	49.00	699.00
7	54.00	700.00
8	58.00	702.00
9	61.00	704.00
10	81.00	714.00

===== INFORMATION FOR CROSS-SECTION NUMBER: 10

142

MANNINGS FRICTION FACTOR = .04500
 KINETIC ENERGY CORRECTION FACTOR = 1.000
 EDDY LOSS FACTOR = 2.000
 DISTANCE(ft.) TO CROSS-SECTION #1 = 750.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	724.00
2	3.00	722.00
3	7.00	720.00
4	23.00	718.00
5	35.00	718.00
6	38.00	720.00
7	41.00	722.00
8	45.00	724.00

===== INFORMATION FOR CROSS-SECTION NUMBER: 11

13720

MANNINGS FRICTION FACTOR = .04500
 KINETIC ENERGY CORRECTION FACTOR = 1.000
 EDDY LOSS FACTOR = 2.000
 DISTANCE(ft.) TO CROSS-SECTION #1 = 830.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	730.00
2	4.00	728.00
3	7.00	726.00
4	10.00	724.00
5	20.00	724.00
6	26.00	724.00
7	40.00	726.00
8	45.00	728.00

12

INFORMATION FOR CROSS-SECTION NUMBER: 12
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 950.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	746.00
2	10.00	744.00
3	18.00	742.00
4	25.00	740.00
5	30.00	740.00
6	35.00	740.00
7	42.00	742.00
8	51.00	744.00
9	60.00	746.00

=====

13

INFORMATION FOR CROSS-SECTION NUMBER: 13
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 1050.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	764.00
2	7.00	762.00
3	10.00	760.00
4	21.00	758.00
5	34.00	757.00
6	52.00	756.00
7	57.00	758.00
8	60.00	760.00
9	64.00	762.00

=====

14

INFORMATION FOR CROSS-SECTION NUMBER: 14
MANNINGS FRICTION FACTOR = .04500
KINETIC ENERGY CORRECTION FACTOR = 1.000
EDDY LOSS FACTOR = 2.000
DISTANCE(ft.) TO CROSS-SECTION #1 = 1150.00

NODAL POINT COORDINATE INFORMATION:

NODE NO.	X(ft.)	Y(elev.)
1	.00	790.00
2	35.00	788.00
3	60.00	786.00
4	70.00	785.00
5	80.00	785.00
6	100.00	785.00
7	105.00	786.00
8	112.00	788.00
9	125.00	790.00

=====

USER-SPECIFIED ENERGY-BALANCE CHANNEL LOCATIONS:

ENERGY BALANCE LOCATION NUMBER	DISTANCE TO CROSS-SECTION #1
1	50.00
2	150.00
3	250.00

6	450.00
7	550.00
8	650.00
9	750.00
10	830.00
11	950.00
12	1050.00
13	1150.00

*** IRREGULAR CHANNEL SUBCRITICAL FLOW MODEL ***

| Standard Step Method irregular channel analysis. Based on development
in "OPEN CHANNEL HYDRAULICS", CHOW(1959) |

| STUDY NAME: Channel Flow = 133.00 cfs
PAGE NUMBER: |

REACH	LENGTH (ft)	WATER LOSS (ft)	FLOW EDDY SURFACE (ft)	FLOW TOTAL DEPTH (ft)	FLOW AREA (ft*ft)	FLOW V (fps)	2 aV / 2g (ft)	TOTAL HEAD (ft)	HYDR RADIUS (ft)	FRICITION SLOPE Sf	A
21+50		.0	617.00	3.00	16.3	8.15	1.033	618.033	1.52	.034986	
				618.033	*1.00		a=1.00			n= .0450	
											GIVEN
035896	50.0	1.795	621.06	4.06	16.4	8.09	1.016	622.075	1.44	.036807	
21+2			SECTION				a=1.00			n= .0450	
			e=1.00								STEEP
034168	100.0	3.417	633.41	3.41	18.0	7.40	.850	634.256	1.41	.031530	
20+4			SECTION				a=1.00			n= .0450	
			e=1.00								STEEP
030292	100.0	3.029	639.00	3.00	19.2	6.91	.742	639.739	1.36	.029055	
19+2			SECTION				a=1.00			n= .0450	
			e=1.50								STEEP
020190	80.0	1.615	641.69	2.69	28.4	4.68	.341	642.035	1.53	.011326	
18+20			SECTION				a=1.00			n= .0450	
			e=2.00								STEEP
019995	60.0	1.200	651.70	2.70	19.4	6.86	.731	652.435	1.35	.028664	
17+60			SECTION				a=1.00			n= .0450	
			e=2.00								STEEP
17+2	450.0		662.12	2.12	22.5	5.91	.542	662.666	1.07	.029107	16

		SECTION			a=1.00			n= .0450
		e=2.00		STEEP				
		-----		-----				-----
028977	100.0	550.0 678.81	2.81	19.8	6.72	.702	679.515	1.31 .028846 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
031056	100.0	650.0 699.69	.69	29.5	4.51	.316	700.006	.65 .033267 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
031796	100.0	750.0 719.31	1.31	23.8	5.59	.486	719.792	.96 .030326 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
030400	80.0	830.0 725.16	1.16	24.3	5.48	.467	725.626	.92 .030474 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
029745	120.0	950.0 741.48	1.48	22.4	5.94	.547	742.024	1.08 .029017 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
030091	100.0	1050.0 757.61	1.61	25.5	5.22	.423	758.028	.84 .031165 .
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----
		SECTION						
		e=2.00		STEEP				
		-----		-----				-----